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Summary

This paper provides an overview of the studies on the effect of solder flux chemistry on the surface insulation resistance due to its interaction with humidity. Hygroscopicity of contaminant, conductivity of electrolyte layer formed, and the leakage current under DC bias on the printed circuit board assembly (PCBA) was investigated for 5 weak organic acids usually found in flux systems namely: adipic, succinic, malic, glutaric, and palmitic. Additionally 5 no-clean wave and selective soldering fluxes were also investigated. The results showed difference in the climatic behaviour of the solder flux in connection with leakage current and corrosion, which is attributed to the properties of the weak organic acids in the flux. The results showed possibility of ranking the flux types based on the properties of the weak organic acids.

1 Introduction

The composition of solder flux applied during the PCBA manufacturing has a direct impact on the corrosion reliability of electronic device. Fluxes are usually composed of inorganic salts and/or acids, which provide oxide removal of the base metal upon application of solder, therefore flux remaining on the base metal is corrosive. In addition to that, it is usually hygroscopic and able to form electrolyte on a surface of printed circuit board assemblies. Thus most issues related to the solder flux originate in presence of high humidity in the atmosphere [1], [2]. An important aspect in relation to the functioning of the electronic device under high humidity is the reduction in surface insulation resistance [2–4].

The results from different testing of flux systems and weak organic acids (WOAs) used in the flux can be found in the literature A number of investigations have been reported on the effects of flux residues on the leakage current and corrosion as a function of humidity, temperature, flux type and its concentrations [2–8]. It is also shown that the soldering process and temperature has an effect on flux residue formation and thereby surface insulation resistance (SIR) [9]. Particular standards provide different test methods and climatic conditions for characterization of flux residue, however the comparison between the behaviour of the flux and constituent WOAs in the flux, and their effect on the reliability of the PCBA under high humidity conditions has not yet been reported.

The aim of the current study is to investigate the effects of different weak organic acids in the flux on the surface insulation resistance and herewith related issues under different humidity conditions, and compare the results with behaviour of actual flux.